



National Transportation Safety Board Aviation Accident Final Report

Location:	LEMMON VALLEY, NV	Accident Number:	LAX93FA352
Date & Time:	09/14/1993, 1642 PDT	Registration:	N221BP
Aircraft:	SCALED COMPOSITES 158-8	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General Aviation -		

Analysis

THE PILOT BEGAN A TIMING RUN AT THE RENO NATIONAL AIR RACES IN A ONE-OF-A-KIND TWIN ENGINE COMPOSITE STRUCTURE PLANE. HE SAID HE WAS LEAVING THE RACE COURSE & TOLD HIS GROUND CREW HE WAS HAVING A PROBLEM WITH THE RIGHT ENGINE. THE TOWER ADVISED HE WAS TRAILING SMOKE. AT THE APEX OF A CLIMB ABEAM THE NUMBERS/NORTH OF RUNWAY 26, A PUFF OF SMOKE FROM THE AIRPLANE WAS SEEN. THE PLANE TURNED RIGHT, PITCHED DOWN WHILE TURNING SOUTHEAST, & DESCENDED AT HIGH SPEED. IT CRASHED ON OPEN TERRAIN IN A WINGS LEVEL, LANDING ATTITUDE WITH THE LANDING GEAR RETRACTED & TRAVELED 900' BEFORE STOPPING. AN EXAM REVEALED THE #1 & #2 CONNECTING RODS HAD OVERHEATED & FAILED FROM LACK OF OIL. THE PILOT'S HELMET, OXYGEN MASK & OTHER COCKPIT COMPONENTS REVEALED EVIDENCE OF AN IN-FLIGHT FIRE & PILOT'S BLOOD WAS 8% SATURATED WITH CARBON MONOXIDE. POST-CRASH FIRE DESTROYED THE COCKPIT, RIGHT WING & WING CENTER SECTION, INCLUDING FUEL SYSTEM BOOST PUMPS & SHUTOFF VALVES NEAR THE PILOT'S FEET. OIL RESIDUE WAS FOUND ON A REMAINING PIECE OF THE RIGHT BOOM (AFT OF RIGHT ENGINE).

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: OIL STARVATION AND CONNECTING ROD FAILURE IN THE RIGHT ENGINE, AND A RESULTANT FUEL FED FIRE.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: MANEUVERING

Findings

1. 1 ENGINE
 2. (C) FLUID,OIL - STARVATION
 3. (C) ENGINE ASSEMBLY,CONNECTING ROD - FAILURE,TOTAL
-

Occurrence #2: FIRE
Phase of Operation: DESCENT - EMERGENCY

Findings

4. (C) FLUID,FUEL - FIRE
-

Occurrence #3: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: LANDING

Findings

5. WHEELS UP LANDING - PERFORMED - PILOT IN COMMAND

Factual Information

On September 14, 1993, at 1642 hours Pacific daylight time, an experimental Pond Racer airplane, N221BP, operated by Bob Pond Racing, Inc., was destroyed during an off airport emergency landing at Lemmon Valley, Nevada. Visual meteorological conditions prevailed for the race qualification flight. The airline transport pilot, the sole occupant, was fatally injured.

The pilot had just requested the timing clock between pylons number five and six when he abruptly initiated a pull up and stated that he was leaving the course. He then advised his pit crew that he had a little problem with the right engine. The tower advised the pilot that he was trailing smoke.

As the pilot was maneuvering east bound at the apex of his climb in the vicinity of the home pylon, a puff of smoke about the size of the aircraft was observed from the area of the right engine. The right propeller was then observed to come to an abrupt stop in the unfeathered position. Next, the landing gear was seen to extend then retract.

The aircraft ground pit crew observed the accident sequence. According to their statements, the rate of smoke dissipation from the right engine on the accident flight appeared to be an oil smoke or oil vapor rather than a coolant type vapor. In their opinion, the puff of smoke over the finish pylon was most probably from a rod failure penetrating the crankcase and/or water jacket.

As the airplane approached abeam of the numbers on the north side of runway 26, it was observed to pitch down while turning right to a southeasterly heading. The aircraft entered a rapid descent on an angle estimated by witnesses between 20 to 30 degrees, at an estimated speed of 200 miles per hour. The airplane collided with soft undulating desert terrain in a wings level, near landing, attitude without a pitch change and with the landing gear retracted.

PILOT INFORMATION

The pilot reported 12,500 hours at his August 5, 1993, first class flight physical, with 500 hours in the preceding six months. The pilot was type rated in B-737, DC-3, DC-9, DC-B26, T-33 and N-B25 aircraft. According to ground crew members, the pilot had flown the accident aircraft for approximately 45 to 50 hours.

AIRCRAFT INFORMATION

The one of a kind composite airframe was manufactured by Scaled Composites, Inc., as an experimental research and development air racing aircraft with a 25.4 foot wing span and a maximum gross weight of 4,150 pounds. At the time of the accident, the aircraft had accrued about 75 total flight hours and had been flown by four different pilots during the initial flight testing and certification. The airplane had reportedly demonstrated excellent single engine performance in flight testing and during actual emergencies.

The aircraft is of a twin boom design, similar to a Lockheed P-38. A derivative automotive type Nissan/Electromotive V-6 engine is installed at the forward end of each twenty foot boom. The landing gear and the coolant radiators are positioned behind each engine. A five pound Halon fire bottle for each engine is located in the respective wheel well. The right Halon bottle and valve assembly was destroyed in the post crash fire. During the flight testing and development of the aircraft, several engines were replaced for a variety of reasons.

The engines installed on the aircraft were highly modified six cylinder Nissan Electromotive VG-30T water cooled and turbo charged engines. During the accident flight the engines were operated at 1,000 horsepower each at 8,000 rpm. During development, the engines were operated at a power output of 650 horsepower each.

According to the aircraft operator, several engine failure episodes were experienced during developmental testing. Loss of oil and oil pressure led to bearing failures and subsequent connecting rod failures. A typical scenario that they had experienced was for the crankcase to become pressurized either during the use of alcohol fuel or due to a failing piston, which would then pressurize the crankcase and pump engine oil overboard.

The right engine had been installed at Mojave prior to the flight to Reno. According to the operator's personnel, the engine had operated normally on the positioning flight to Reno.

The wet wing design carries about 80 gallons of fuel distributed from tip to tip. The fuel system boost pumps, electric shutoff valves, and fuel lines are located in the cockpit between the pilot's feet and legs.

For inflight emergency egress the Plexiglas canopy is ringed with explosive cord designed to shatter the canopy. Two pull ring squids are located on either side of the canopy frame to ignite the cord. During examination of the wreckage, the explosive cord was found unused and the pull rings were in position. The pilot wore a backpack parachute.

WRECKAGE AND IMPACT INFORMATION

The wreckage site was located about two miles southeast of the Reno Stead Airport in an area known as Lemmon Valley. The wreckage path was measured to be about 900 feet in length on a magnetic heading of 185 degrees. The first ground scars were identified as two parallel ground disturbances on the right side of the extended median wreckage distribution line. The tracks were dimensionally similar to the propeller blades.

Four propeller blade strikes were found on the left side of the wreckage path centerline at a point 50 feet from the initial ground scars. On the opposite side of the strikes, a ground scar was located which was dimensionally similar to the right engine nacelle.

Over the next 400 feet of the wreckage path, various nacelle impact signatures, right wing tip impact signatures, three sections of the canopy plexiglas and the right wing tip were distributed. The first signature of a fire was located on a natural desert bush near the centerline of the wreckage path, about 350 feet from the main wreckage location. The pilot's helmet, oxygen mask/microphone and unplugged oxygen hose was found on the left side of the wreckage path near the right aileron.

At 180 feet from the final wreckage location, the left engine propeller assembly was found on the right side of the wreckage path with the blades in the feathered position. Examination of the propeller revealed chordwise striations on the blades and trailing edge "S" bending.

At a point 135 feet from the main wreckage point of rest, desert brush was noted to be burned on the left side of the wreckage path. A fuselage ground scar was noted on the centerline of the distribution line. On the right side of the centerline was located a right nacelle ground scar.

Examination of the main wreckage revealed that the post crash fire had destroyed the entire cockpit, right wing, and the wing center section. Examination of the airframe revealed that the structural components were all accounted for and the main structure was intact with boom

separations at the horizontal stabilizer. Control continuity was not possible due to the extent of the fire.

The left wing and fuel tank area remained intact. The center section tank area was destroyed by fire. The right wing outboard of the fuselage and boom was totally destroyed by fire except for the wing spar. The fuel system boost pumps and electric shutoff valves located between the pilot's feet and legs were destroyed by fire. One of the two fuel pumps and shutoff valves was found several feet beyond the main wreckage.

MEDICAL AND PATHOLOGICAL INFORMATION

On September 15, 1993, the Washoe County Medical Examiner performed an autopsy on the pilot. According to the autopsy report, the cause of death was thermal burns. Soot was found in the tracheal mucosa and larynx. No pre-existing conditions were noted during the autopsy that would have adversely affected the decedent's abilities to pilot the aircraft. Specimens were obtained during the autopsy for toxicological examination by the FAA Civil Aeromedical Institute in Oklahoma City, Oklahoma.

The results of the toxicological analysis conducted on the specimens were negative for all screened drug substances and alcohol. Carbon Monoxide saturation in the blood was positive at eight percent.

TESTS AND RESEARCH

On March 23, 1994, an examination of the right engine was conducted. During the course of the examination, it was determined by the engine manufacturer's technical representative that the number one and two connecting rods had overheated and failed from lack of oil. The rods, caps, and throws all exhibited heat signatures with blueing of the steel components. The failures had created holes in the oil pan and crankcase/water jacket of the engine. The engine had seized and would not turn. A limited borescope examination of the cylinders revealed a possible metal transfer between the piston and the cylinder wall of the number two cylinder.

Examination of the right aft boom section revealed a light oil residue on the exterior.

The oil filter element was cut open and examined, with fine particles of aluminum found throughout. The engine oil pump was disassembled and examined. The drive belt was intact and undamaged. The pump and scavenge gears exhibited normal wear signature. All sections of the pump had trace amounts of aluminum particles.

The four blade Hartzell propeller was still attached to the gear box/drive shaft. The two lower blades exhibited aft bending. The inboard upper blade exhibited extensive fire damage.

An electronic data logger recorder was recovered from the left engine. The data was retrieved from non-volatile memory documented all of the parameters of operation at the time of the accident. According to the data logger, about sixty seconds before ground impact the throttle position was reduced to about twenty percent open. About ten seconds before ground impact, the throttle was increased to about sixty percent open. The parameters recorded at that time were: 1) 6,805 engine revolutions per minute, 2) 1,829 propeller revolutions per minute, and 3) 48 inches of manifold pressure. The listed values were carried to ground impact. At impact the data logger recorded a brief underspeed to 4,500 rpm then an overspeed to about 7,000 engine rpm.

The pilot's helmet with attached visor, oxygen mask, plastic mask connector tubing, white

baseball cap, two sections of canopy plexiglas, and an exemplar sample of the fuel (automotive blend A-10-P) being used in the aircraft were all sent to the Armed Forces Institute of Pathology (AFIP) in Washington, D.C. The materials were examined for traces of ignition and fire signatures.

The AFIP report states that: "The presence of combustion residues on the physical evidence, which separated from the pilot and the aircraft at the initial touch-down site, are consistent with an in-flight fire."

ADDITIONAL INFORMATION

The aircraft wreckage was released to representatives of the owner on March 23, 1994, at the conclusion of the engine examination.

Pilot Information

Certificate:	Airline Transport	Age:	38, Male
Airplane Rating(s):	Multi-engine Land; Multi-engine Sea; Single-engine Land	Seat Occupied:	Center
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	05/08/1993
Occupational Pilot:	Last Flight Review or Equivalent:		
Flight Time:	12500 hours (Total, all aircraft), 50 hours (Total, this make and model), 250 hours (Last 90 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	SCALED COMPOSITES	Registration:	N221BP
Model/Series:	158-8 158-8	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	Yes
Airworthiness Certificate:	Experimental	Serial Number:	001
Landing Gear Type:	Retractable - Tailwheel	Seats:	1
Date/Type of Last Inspection:	09/07/1993, Annual	Certified Max Gross Wt.:	4150 lbs
Time Since Last Inspection:	6 Hours	Engines:	2 Reciprocating
Airframe Total Time:	75 Hours	Engine Manufacturer:	ELECTRAMOTIVE
ELT:	Not installed	Engine Model/Series:	VG-30T
Registered Owner:	BOB POND RACING INC.	Rated Power:	1000 hp
Operator:	BOB POND RACING INC.	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	4SD, 5046 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	1641 PDT	Direction from Accident Site:	0°
Lowest Cloud Condition:	Clear / 0 ft agl	Visibility	10 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	14 knots / 20 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	220°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	23° C / -2° C
Precipitation and Obscuration:			
Departure Point:	RENO, NV (4SD)	Type of Flight Plan Filed:	None
Destination:	(4SD)	Type of Clearance:	VFR
Departure Time:	1630 PDT	Type of Airspace:	Class D

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	In-Flight
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	GEORGE E PETERSON	Report Date:	09/30/1994
Additional Participating Persons:	MIKE CLARK; RENO, NV		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinquiry@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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